Cells derived from embryonic stem cells, iPS cells appear immature

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A trend over the past few years has been comparing embryonic stem cells, adult stem cells and reprogrammed adult cells (also known as iPS cells) to each other and to other cell types. The goal is to understand what the cells are, exactly, and and how they differ from each other. Eventually this information could help researchers learn which type of cell will be most effective for developing therapies, understanding diseases or drug screening.

A group of CIRM grantees at UCLA has published the latest in the unfolding story of stem cell comparisons. In their case, they didn't compare the stem cells themselves. Instead, they matured embryonic stem cells and iPS cells into the cells that eventually form neurons, cells that eventually form skin, and cells that eventually form liver. These so-called progenitor cells also exist in adult humans, where they lurk in tissues waiting to be needed to repair damage.

The scientists compared the progenitor cells to each other and to equivalent cells taken from adult tissue as well as to developing tissues. What they found is that the progenitors for nerves, skin and liver that came from embryonic or iPS cells had a lot in common with each other and with developing tissues. However, they had much less in common with their counterparts taken from adult tissues.

A press release from UCLA quotes William Lowry, who was senior author on the paper, which appeared in *Cell Research*.

“ "What we found, looking at gene expression, was that the cells we derived were similar to cells found in early fetal development and were functionally much more immature than cells taken from human tissue. This finding may lead to exciting new ways to study early human development, but it also may present a challenge for transplantation, because the cells you end up with are not something that's indicative of a cell you'd find in an adult or even in a newborn baby."
The release goes on to quote first author Michaela Patterson:

“ "One important reason to do this is to ensure that the cells we are creating in the Petri dish and potentially using for transplantation are truly analogous to the cells originally found in humans," said Michaela Patterson, first author of the study and a graduate student researcher. "Ideally, they should be a similar as possible."

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"The roles these cells play in the fetus and the adult are inherently different," she said. "It may be that the progeny, if transplanted into a human, would mature to the same levels as those found in the adult liver. We don't know."

This is the first paper we've seen comparing progenitor cells to adult or developing tissues. As with all first steps, we'll likely see more papers over the next few years refining and expanding on this team's findings and clarifying what these findings mean in terms of transplantation.

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A.A.

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